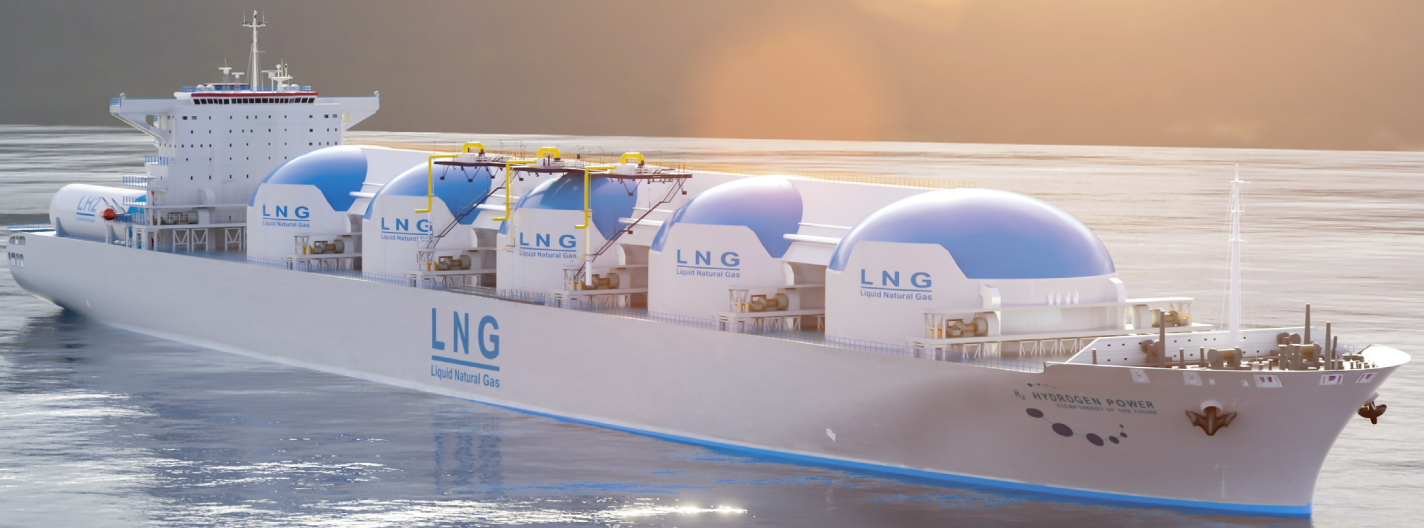


EXPANSION JOINTS for LNG / NG CARRIERS





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AYVAZ Metallic Expansion Joints for Cryogenic Applications in Marine Industry

Product Overview

AYVAZ metallic expansion joints are essential components in cryogenic systems within the marine industry, accommodating thermal expansion and contraction in piping systems while maintaining structural integrity and preventing leaks. Engineered specifically for cryogenic applications, these expansion joints ensure reliable performance under extreme conditions.

Typical Applications of Expansion Joints

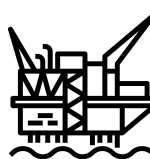
LNG (Liquefied Natural Gas) carriers: Expansion joints are strategically installed in LNG carrier piping systems to accommodate thermal expansion and contraction during the loading, transportation, and unloading of liquefied natural gas. These joints are commonly located at connection points between cargo transfer lines, cargo tanks, and vapor return lines to ensure seamless operation and prevent stress on the piping system.

LPG (Liquefied Petroleum Gas) carriers: Expansion joints are essential components in LPG carrier piping systems, especially in cargo handling and transfer lines, as well as vapor recovery systems.

Offshore platforms and installations requiring cryogenic fluid handling: Expansion joints are utilized in cryogenic piping systems on offshore platforms and installations for various applications, including gas processing, liquefaction, and storage. These joints are strategically positioned at connection points between process equipment, storage tanks, and distribution lines.

Cryogenic fuel transfer systems: In marine applications utilizing cryogenic fuels such as LNG or liquid hydrogen for propulsion, expansion joints are integral to the fuel transfer infrastructure. These joints are placed along fuel transfer lines, including bunkering systems, to accommodate thermal expansion and contraction during fuelling operations and ensure safe and efficient transfer of cryogenic fluids.

Refrigeration systems for marine vessels: Expansion joints play a crucial role in refrigeration systems onboard marine vessels, particularly in cryogenic refrigeration circuits and cold storage facilities. These joints are installed at critical points in the refrigeration piping network, such as compressor discharge lines, evaporator coils, and condenser circuits, to facilitate thermal movement and prevent system damage.

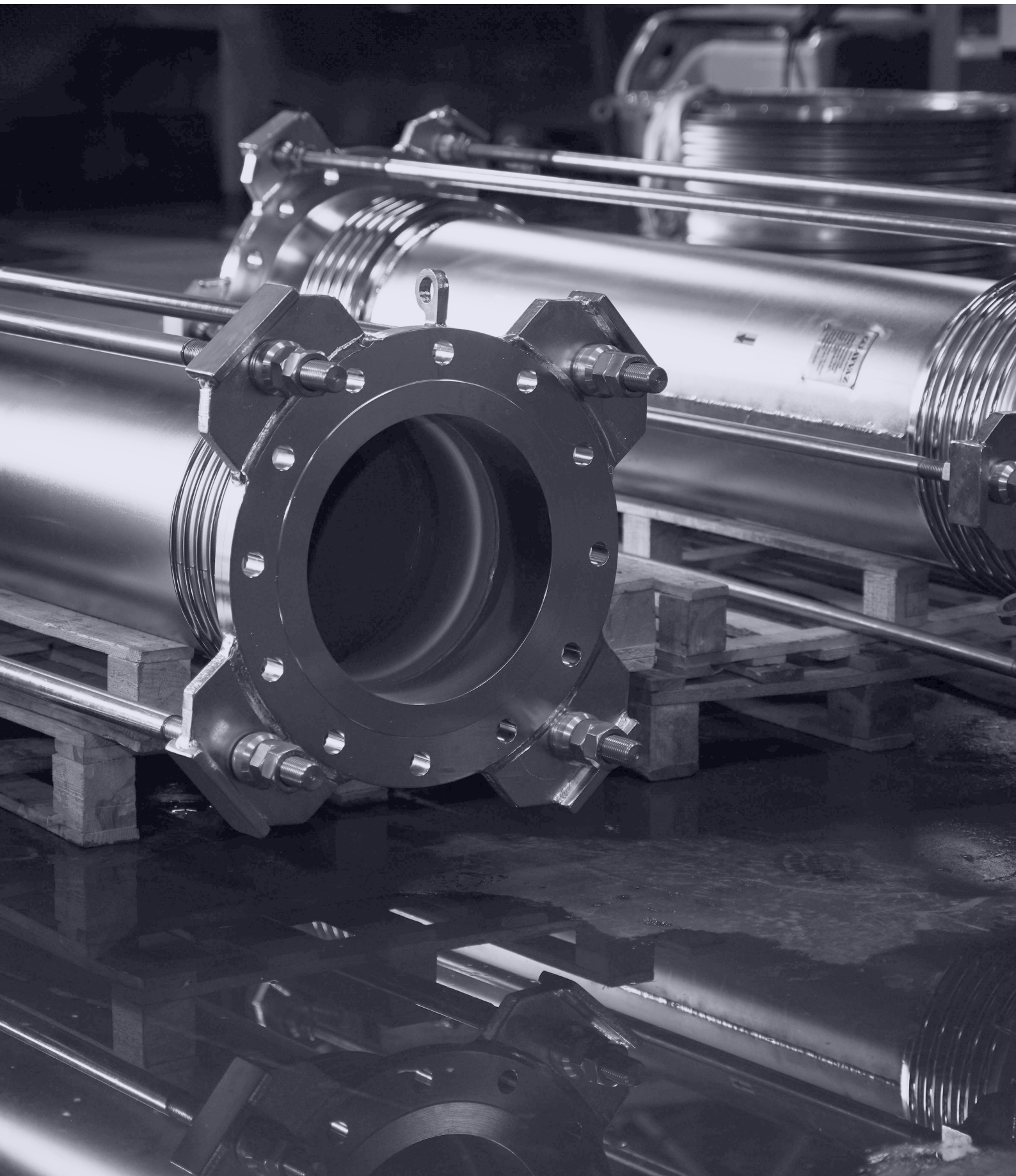


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Key Features

Temperature Range: Ayvaz Marine Expansion joints are specifically designed and constructed to withstand the extreme temperatures encountered in cryogenic applications (-196°C and below).

Pressure Rating: Suitable for pressures typically encountered in marine cryogenic systems up to PN40. Pressure ratings must be verified through rigorous testing to ensure the joints can safely contain cryogenic fluids under operating conditions.

End Connections: Available with flanged, welded, or threaded connections as per project requirements. Sealing mechanisms such as bellows, gaskets, and welds are designed and tested to ensure they maintain integrity under cryogenic conditions.

Size Range: Ayvaz Offers in a range of diameters from DN40 to DN1000 to accommodate various piping sizes and configurations. Bigger sizes are available on request on project basis.

Fatigue Resistance: Ayvaz Marine Expansion joints are designed to withstand cyclic loading and fatigue caused by thermal expansion and contraction cycles in cryogenic piping systems. Minimum fatigue life for Ayvaz Marine Expansion joints is 8000. This value is conducted to verify the structural integrity and longevity of the expansion joints under operational conditions.

Design Standards: Ayvaz Marine Expansion joints are manufactured in accordance with industry standards such as EN 14917+A1, ASME B31.3, EJMA, and others.

Material Composition: Manufactured from high-grade metallic alloys such as stainless steel, nickel alloys, or other corrosion-resistant materials suitable for cryogenic temperatures.

Cryogenic Compatibility: Engineered to withstand ultra-low temperatures encountered in marine cryogenic systems without compromising performance or integrity.

Flexibility: Offers exceptional flexibility to absorb thermal expansion and contraction, minimizing stress on piping systems and equipment.

Leak Tightness: Provides superior sealing properties to prevent leakage of cryogenic fluids, ensuring safety and operational efficiency.

Durable Construction: Constructed with robust design and precise manufacturing processes to withstand harsh marine environments and prolonged exposure to extreme temperatures.

Corrosion Resistance: Resistant to corrosion and deterioration caused by exposure to cryogenic fluids and marine conditions, ensuring long-term reliability.

Benefits

- Enhances system reliability and safety in cryogenic applications.
- Reduces maintenance costs by minimizing wear and tear on piping systems.
- Improves operational efficiency by accommodating thermal fluctuations without compromising performance.
- Extends equipment lifespan by protecting against leaks and structural damage.



A Prestigious Global Partner

Manufacturer Experience: With over 70 years of manufacturing experience, AYVAZ specializes in the design and production of metallic expansion joints for various industries, including the marine sector.

Custom Solutions: AYVAZ offers customized design solutions tailored to meet specific project requirements, including size, configuration, and end connections.

Short Delivery Times: With extensive manufacturing capabilities and a dedicated project management team, AYVAZ ensures short delivery times to meet project deadlines.

Supply Chain Capabilities: AYVAZ leverages its extensive supply chain network to reduce raw material costs and provide cost-effective solutions to customers.

Global Sales and Marketing Network: With an extensive sales and marketing organization spanning from North America to the Far East, Europe, and the Middle East, AYVAZ provides comprehensive support to customers worldwide.





Ayvaz Engineering Activities

CAD and 3D Illustrations: AYVAZ employs CAD software and 3D illustrations to facilitate the design and visualization of expansion joints, enabling accurate modeling and representation of product configurations.

BIM & REVIT Activities: AYVAZ participates in Building Information Modeling (BIM) and REVIT activities to integrate expansion joint designs into digital models of marine infrastructure, enhancing coordination and collaboration among project stakeholders.

FEA Analysis using ANSYS Mechanical: AYVAZ conducts Finite Element Analysis (FEA) using ANSYS Mechanical software to simulate and evaluate the structural behavior and performance of expansion joints under various operating conditions, ensuring reliability and durability.

ANSYS CFD Analysis: Computational Fluid Dynamics (CFD) analysis using ANSYS software enables AYVAZ to analyse fluid flow patterns and heat transfer characteristics within expansion joints, optimizing design parameters for enhanced performance and efficiency.

EJMA Calculation Software: AYVAZ utilizes its proprietary EJMA calculation software developed by its engineering experts to perform accurate calculations and predictions of expansion joint behavior according to the guidelines set by the Expansion Joint Manufacturers Association (EJMA).

Quality Assurance

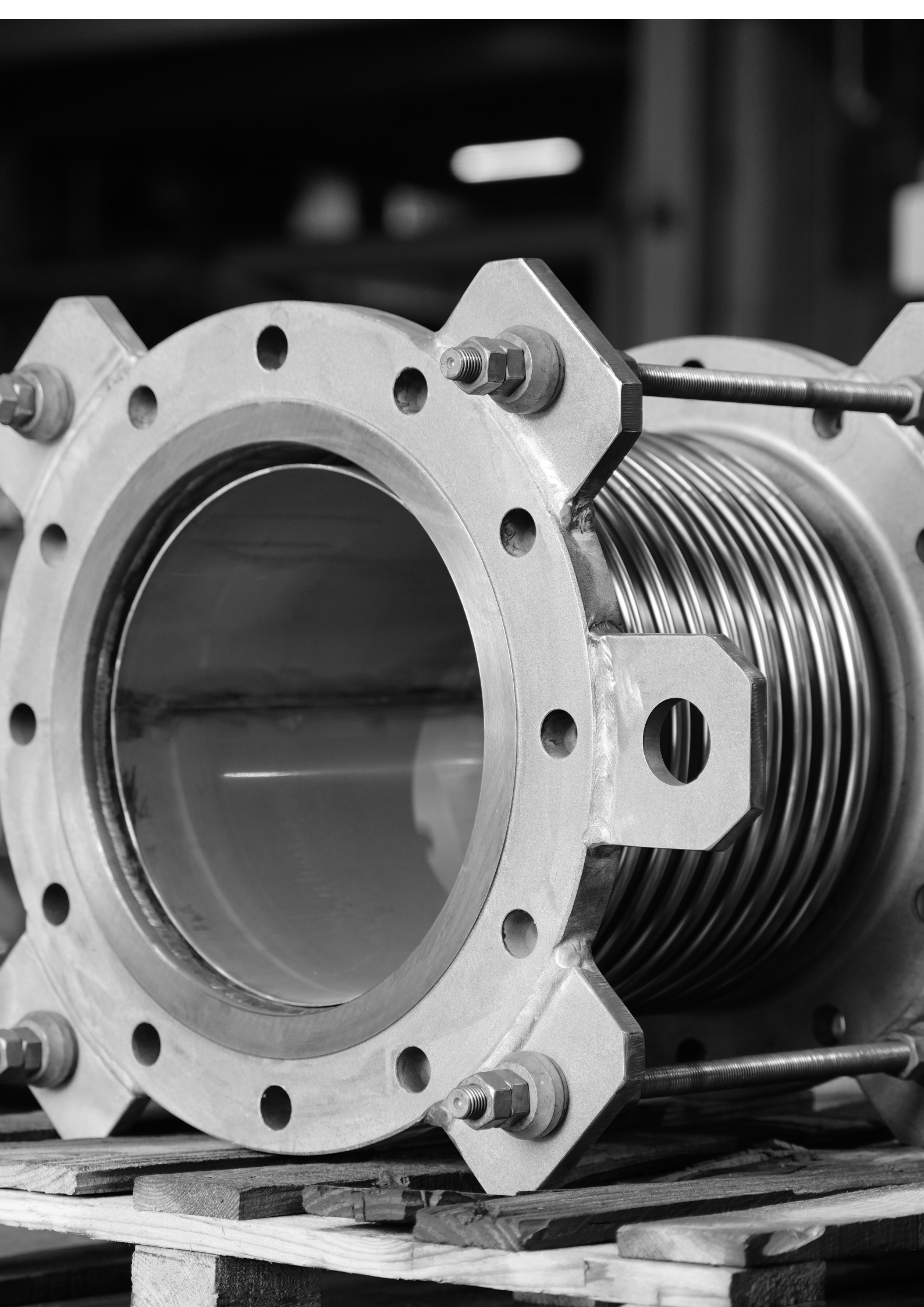
- Rigorous quality control measures ensure compliance with specifications and standards.
- Material traceability and documentation provided for full transparency and accountability.
- Testing procedures include hydrostatic testing, cryogenic testing, and dimensional inspections.

Certification

AYVAZ expansion joints are certified by leading classification societies, including:

- Bureau Veritas (BV)
- Lloyd's Register (LR)
- Det Norske Veritas (DNV)
- American Bureau of Shipping (ABS)
- Korean Register of Shipping (KRS)
- Nippon Kaiji Kyokai (NK)
- Registro Italiano Navale (RINA)





Ayvaz Production Capabilities

Production Area: AYVAZ operates from a 50.000 sqm closed production area dedicated to metal expansion joint production, ensuring efficient manufacturing processes and quality control.

Workforce: With over 600 workers, AYVAZ maintains a skilled workforce capable of handling various aspects of production, from design and fabrication to testing and quality assurance.

Size Capacity: AYVAZ has the capability to produce metallic expansion joints up to DN6000mm, accommodating a wide range of pipe diameters in marine applications.

Weight Capacity: AYVAZ can manufacture expansion joints weighing up to 20 tons as a single piece, enabling the production of large-scale components for marine cryogenic systems.

Testing Facilities: AYVAZ has in-house product testing facilities, including hydrostatic pressure testing, full vacuum testing, and helium leakage testing, ensuring the reliability and performance of expansion joints under extreme conditions.

Dimensional Control: AYVAZ utilizes 3D dimensional controlling and scanning devices to verify the accuracy and precision of expansion joint dimensions, maintaining compliance with design specifications and industry standards.

Non-Destructive Testing (NDT): AYVAZ has in-house NDT facilities and personnel to perform various testing methods, including RT (Radiographic Testing), PT (Liquid Penetration Testing), UT (Ultrasonic Testing), MT (Magnetic Particle Testing), and VT (Visual Testing), ensuring the integrity and quality of expansion joints throughout the manufacturing process.

Sandblasting Facilities: Ayvaz's in-house sandblasting facilities are designed to prepare components to the highest standards. Our sandblasting process effectively removes rust, scale, and surface contaminants from metal surfaces, ensuring an optimal foundation for further coating or painting. This process is crucial for enhancing the durability and performance of the components, especially those used in demanding environments such as wind turbines.

Painting Facilities: Following sandblasting, components are moved to our advanced painting facilities. Ayvaz offers a range of painting solutions tailored to meet specific customer needs. Our facilities are equipped to handle both standard and custom paint finishes, ensuring that each component not only meets technical specifications but also achieves the desired aesthetic appeal and protective characteristics.

Special Applications

FLNG Facilities: FLNG facilities are designed to produce, liquefy, store, and offload LNG at sea, eliminating the need for onshore infrastructure. Expansion joints are employed in the cryogenic piping systems throughout the facility, including liquefaction trains, storage tanks, loading arms, and offloading systems.

FPSO Units: FPSO units are floating vessels used for offshore oil and gas production, processing, storage, and offloading. Expansion joints are utilized in cryogenic systems onboard FPSO units, particularly in gas processing modules where cryogenic gases such as LNG or LPG may be handled. These joints are installed in piping networks associated with gas compression, refrigeration, and liquefaction processes to accommodate thermal expansion and contraction during operation.



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